CHAPTER 3

A SIMPLE, MODEL-INDEPENDENT ANALYSIS OF REASONS FOR NON-FULFILLMENT OF THE DECLARED INFLATION TARGET

MICHAL SKOŘEPA

1. INTRODUCTION

Success of a central bank managing its monetary policy under an inflation targeting regime may be measured in many ways. In addition to the indicators such as inflation stability, its trend toward the values targeted over a long period, or inflation expectations hovering close to inflation targets, unquestionably the degree of alignment between actual inflation and inflation targets is a natural yardstick of success for an inflation targeting central bank. A comparison of inflation targets of the Czech National Bank (CNB) and actual evolution of inflation as from 1998, the year when the CNB began to manage its monetary policy under an inflation targeting regime, until the end of 2007, shows that the inflation target midpoints were distinctly more frequently undershooted than overshooted.

Using purely statistical tools, this paper will examine options for explaining the above asymmetries in non-fulfillment of inflation targets. An advantage of this approach is the simplicity and maximum possible elimination of arbitrary expert interventions in the form of calibrated coefficients or in the form of a model corresponding to a single one out of the multiple and competing macroeconomic schools of thought. A price to pay for such elimination of additional information sources utilisable for estimation is the fact that the results are indicative only.

The causes of observed undershooting of inflation targets could be either outside the CNB, i.e. undershooting was due to a prevailingly anti-inflationary character of external shocks, or inside the CNB, i.e. undershooting was due to the CNB's monetary policy being conducive to lower than officially targeted values (whether or not such biased targeting was deliberate). And this CNB-made undershooting might have been already included in the documents available to the CNB Bank Board for their decision making, or it might have been developing in the Bank Board members' minds during their decision making only.

Our computations suggest that an explanation through a bias of the CNB's monetary policy seems statistically more credible. A closer look at the period since 2002 then leads to a conclusion that the bias of the CNB's monetary policy over that period came into existence not in the course of decision making by the Bank Board but already during the preparation of forecasts, on which the Bank Board based its decisions.

The rest of this paper is structured as follows: Section 2 provides a description of the inflation gap during the period under review, while Section 3 articulates three core hypotheses addressed by the paper. Section 4 brings details on the procedure used to identify which of the hypotheses is better in describing the time series of the inflation gap values. Section 5 presents the results of computations and Section 6 contains a summary of the key ideas of the paper.

2. PERIOD UNDER REVIEW

Monetary policy of the CNB followed the inflation targeting logic commencing as of the turn of 1997 and 1998. If we assume, for the sake of simplicity (throughout this paper), an approximately one year lag between a monetary-policy decision and its impact on inflation, then it makes sense to examine the reasons of unmet targets starting with the turn of 1998 and 1999. On the overall, we will therefore analyse (non-)fulfillment of targets for the period 12/1998–12/2007. In the period 12/1998–12/2001, targets were set only for December of each year and, for that period, we design implicit inflation targets for the other months of each year by linear interpolation of actual targets. We obtain 109 months in total, in each of which we can compare the target to actual inflation (Figure 1) and to obtain the inflation gap value defined as a difference between actual inflation and inflation target (Figure 2).

Figure 1: Evolution of the (implicit) inflation target and the respective inflation indicator

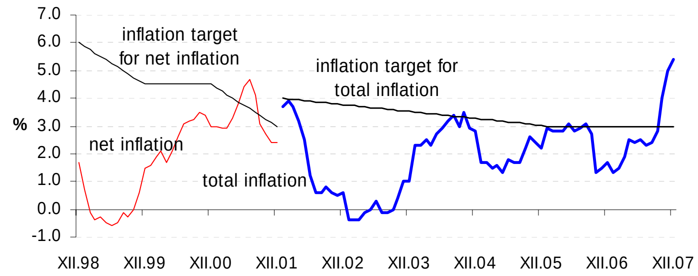
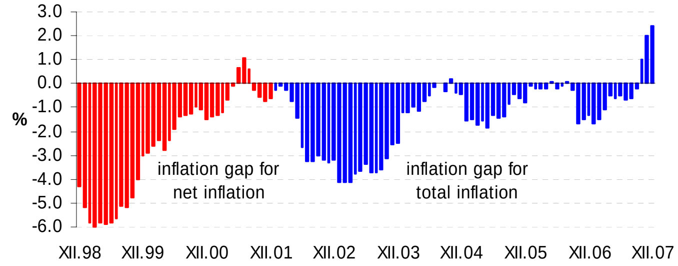


Figure 2: Evolution of the inflation gap



This period may be examined either in total as a single stage or broken down into multiple stages. The more refined analysis (more stages) we choose, the more detailed information on evolution of target non-fulfillment factors over time is gained but at the same time the less quality such information has in statistical terms because by using a larger number of stages we reduce the number of observations (and, consequently, the number of degrees of freedom) in each of them.

Several breaks may be found across the entire period of 1998–2007 that may be used as a basis for defining specific stages. From the perspective of the inflation targeting implementation technique at the CNB, e.g. the year 2002 is significant when the CNB forecasting team migrated from predominantly expert-based preparation of forecasts to forecasting that integrated both the expert and model approaches (CNB, 2002, Coats, Laxton & Rose, 2003). From the viewpoint of the basic inflation targeting philosophy in the Czech Republic and also the experience of the CNB Bank Board with the regime and evolution of domestic inflation, specifically the year 2003 was highly important. In that year, two strong (and interrelated) reasons existed for a shift in the CNB Bank Board's preferences towards more relaxed monetary policy: A period of intensive deliberate disinflation came to an end and the Czech economy even experienced several months of deflation. Furthermore, there were gradual personnel changes within the CNB Bank Board during 1998–2007, which were probably causing changes in the Board's overall preferences as well.

Therefore, reasons exist to believe that certain structural breaks occurred during the period under review. In the interest of maintaining a sufficient number of degrees of freedom, however, we will present results only for the period 12/1998–12/2007 as a whole in our paper.[1]

3. HYPOTHESES

There are two core potential causes of asymmetries in deviations of inflation from the inflation target: a bias in the shocks hitting the Czech economy (i.e. such shocks have a nonzero value on average) and a bias of the CNB. Within the CNB's bias, a bias of the forecasting apparatus might be identified (i.e., its outputs help to achieve an inflation target that differs from the declared one), as well as a bias in the preferences of the Bank Board (i.e., its decisions help to achieve an inflation target that differs from the declared one). The bias of the Bank Board's preferences may take the form of either a biased minimum of a symmetrical loss function of the Bank Board (see e.g. Svensson, 1996) or an asymmetry of the loss function of the Bank Board (see e.g. Cukierman & Muscatelli, 2007).

The majority of other potential sources of non-fulfillment of the inflation target may be viewed as included under one of the above-mentioned core spheres. A biased picture of the economy, for example, that may be contained in the statistical data available at the time of monetary policy decision making (i.e. the problem of working with the data in real time), may be categorised under the biased forecasting apparatus sphere (even though the factor is in fact outside the CNB's control).

The above potential reasons may be briefly summarised into three hypotheses:

Hypothesis A (derived from the word "apparatus"): The CNB's forecasting apparatus was biased.
Hypothesis B (derived from the phrase "Bank Board"): Preferences of the CNB Bank Board were biased.
Hypothesis S (derived from the word "shocks"): Shocks were biased.

4. THE METHOD

In fact each, even a seemingly absolutely non-model, purely statistical procedure has to be based on some, though rudimentary model of reality. In our case, we will start from a simple model, under which monetary policy always takes such steps as to keep inflation in proximity of the inflation target, i.e. to maintain an inflation gap close to zero; in case such inflation gap, due to a shock, is nonzero at a given point in time, monetary policy will take steps to drive the gap back to zero step by step. The speed of return of the inflation gap to zero is subject to persistence of inflation that may be modelled as an autoregressive process. [2]

An actual inflation gap may more or less differ from such a modelled trajectory in certain months, i.e. we are able to measure the error of our statistical model. If such an error occurs, the model will fully adapt to it in the very next month, while it will also begin to "dissolve" the error immediately through the autoregressive process. The dissolution process may be joined by another, new error of

[1] Computations made for shorter stages, in a manner explicitly revealing potential influence of the above structural breaks, led to non-intuitive results, in particular for the stages covering several recent years - probably due to an insufficient number of degrees of freedom.
[2] A method of the inflation gap analysis based, in contrast, on a detailed model of economy functioning is described e.g. by Fiáček (2007).

the inflation gap model at any time later on. If the new error points further away from zero (i.e. in the same direction as the preceding error), the decay of the total error will of course take longer; conversely, if the new error points towards zero, the decay of the total error will be faster.

The larger the error that occurs during the inflation gap evolution as opposed to the model trajectory, the stronger is the suspicion that it is a shock - a manifestation of an unusual event that is "exogenous", i.e. it is not a part of the entire process: monetary policy has not expected the event and its impact on the inflation evolution and could not therefore make any pre-emptive steps that would prevent such an impact on inflation. The below-described statistical procedure implicitly offers one possible definition of the limit beyond which we will treat an error as "exogenous", i.e. as a shock.

We will study how well various combinations of intensity of impact of the two basic reasons of the non-fulfillment of the inflation target (CNB's bias vs. shocks) provide an explanation of empirical data on the inflation gap evolution. The impact of the CNB's bias, i.e. the bias of its forecasting apparatus and bias of the Bank Board's preferences, may be modelled as the difference a between an inflation target that is *manifested* (towards which monetary policy truly drives inflation), symbolically $\pi_t^T + a$, and an inflation target that is *declared*, symbolically π_t^T. We will generally suppose that, during the whole period under review, monetary policy was behaving as if striving for the inflation gap of size a. The case of the CNB's bias towards undershooting can be expressed as $a < 0$. Hence if the computation gives $a < 0$, that will support hypotheses A and B.

We will model the second basic possible cause of undershooting, i.e. shocks, with the help of dummy variables within an autoregression process, i.e. as abrupt shifts of the inflation gap to another level, at which it will restore its gradual convergence to a.

Of course, we need to define a meaningful method of identification of concrete periods in which a shock is most likely to have occured, i.e. periods in which we will assign the value of 1 to a dummy variable (while the dummy value will be 0 in all other periods). We will suppose now that the suspicion of a shock occurrence – and therefore use of value 1 for its corresponding dummy variable – is substantiated particularly in the month in which we identify a major error of the autoregression model alone, i.e. without any dummy variables. A shock that will manifest itself by changes in the inflation gap (and therefore by errors within the autoregression model) in two or more months in a row will be recorded as a series of two or more of one-month shocks, i.e. in the form of two or more dummies, each of which attains value 1 in just one month.

If we use dummy variables for one or multiple months selected according to the described method (each dummy variable for one month) and if the computation leads to the conclusion that such enrichment of the autoregression model with one or more dummy variables statistically helps to explain the observed evolution of the inflation gap, it will become a support for hypothesis S.

It should be pointed out that a lesser difference exists between the "shocks" and the "CNB's bias" than it may appear: both cases basically represent a set of shocks. The difference between the two categories is in what types of shocks (in terms of their duration) they include. The "CNB's bias" is a set of long term (or repetitively acting) shocks, such as a discrepancy between the manifested inflation target and the declared target; the set may however include also e.g. a recurring, unexpectedly strong appreciation of the nominal exchange rate, or an unexpectedly long-term and fierce fight of chain-stores over their shares of the Czech market through suppressing planned increases in retail prices. The "shocks", on the other hand, represent a set of one-off shocks, whether that means a leap in the regulated prices, a change in the VAT rates, a short-term and abrupt appreciation of the exchange rate, or e.g. an isolated considerable mistake of the CNB apparatus in preparing a forecast or of the Bank Board in setting the levels for the monetary policy rates.[3]

Consequently, if the CNB was *repetitively* surprised by e.g. a stronger than forecasted appreciation of the nominal exchange rate, the method adopted in this paper will classify such a factor under the "CNB's bias" category instead of the "shocks" category. This approach appears not to be in any gross conflict with the intuitive meanings of the words "shock" and "CNB's bias": we might talk about a "shock" to refer to the central bank's surprise, which surfaces at times only and is therefore uncommon, while if the central bank is surprised from a certain direction either repetitively or throughout a long period of time, we should view it as a consequence of the fact that the bank misunderstands the fundamental rules of functioning of the domestic economy and the environment in which the economy works.[4]

We will estimate the statistical significance of separate types of bias using the method of minimisation of the Akaike Information Criterion over three arguments:[5]

- degree of autoregression of the inflation gap (p),
- number of shocks (n) ordered in the descending order from the largest one,
- extent of the CNB's bias (a).

In the first step, we will run an OLS regression in which we will use the process AR(p) to model the time series of the values of the inflation gap π_t - π_t^T for a given p and a given a. We will consider any errors (residuals) of the model to be indications of the key shocks to inflation during the period under review. The larger the error, the more probable it is that there is a shock (in the above meaning) hidden behind the error. We therefore order the AR(p) process errors by their size, from the largest to the smallest; in the below estimations, we will pay particular attention to the largest errors as they are the most probable reflections of shocks.

In the second step, we will perform an OLS regression in which the simple AR(p) process will be enriched with the dummy variable D_1, which corresponds to the *largest* shock. That way, we will develop a model which consciously supposes that the inflation gap evolution over the period under review may be explained by the CNB's bias and this *single* shock. The dummy variable will have the value of 1 in the month in which the *largest* error of the AR(p) process was measured, and, value 0 in the other months. This of course does not mean that our expectation is that the respective shock manifested itself in inflation as a shift by that particular 1 percentage point: the estimated scope of manifestation of the given shock in inflation will be identified by the coefficient (coefficient β_{21} in the below equation) that will be assigned by the estimation procedure to this dummy.

[3] Apart from short-term shocks ("the shocks") and long-term shocks ("the CNB's bias"), also medium-term shocks may of course occur that were neither manifested by a leap within the inflation gap month to month, nor recurring for most of the period under review. Using the econometric method selected in this paper, these latter shocks are classified under one or the other extreme category (the CNB's bias vs. shocks), according to their specific duration. This simplified perception of the inflation evolution as short- and long-term shocks is a price we pay for the model-independence, simplicity and transparency of the entire method.

[4] The conclusion made by J. Filáček (2007) that the inflation gap evolution in the Czech Republic in 2000–2006 is to quite a degree explained by *repetitively* erroneous assumptions of foreign evolution, may be therefore also interpreted, using the language of our paper, as a consequence of the CNB's bias.

[5] The computations were carried out using a suite of applications developed in the EViews 6 environment.

In the next step, we will then perform another regression where the simple AR(p) process will be enriched with the dummy variable D_1 and, in addition, the dummy variable D_2, which corresponds to the *second largest* shock. The dummy variable D_2 will have the value of 1 in the month in which the *second largest* error of the AR(p) process was measured, and value 0 in the other months. By enriching the AR(p) process with the variables D_1 and D_2, we will develop a model which consciously supposes that the inflation gap evolution may be explained by the CNB's bias and by *two* shocks. After that, we will keep enriching the simple AR(p) process with D_1, D_2 and additional dummy variables, corresponding to even smaller shocks.

We obtain a set of regressions for given p and a; the regressions differ in the value of n, i.e. in the number of explicitly modelled potential shocks. In the same way, we will obtain sets of regressions with various values of n also for other realistic values of p and a. Within the whole array of regressions thus obtained, we will then look for the regression that records the lowest value of the corrected Akaike Information Criterion (AIC) (i.e. a standard AIC with the second-order correction for small samples).[6]

We will select values of a at degrees of 0.25 pp and, for the sake of maintaining the largest possible number of the degrees of freedom, we will assume a constant a throughout the entire period under review. Therefore, we will estimate relationships in the form

$$\pi_t - (\pi^T_t + a) = \sum_{1}^{p} \beta_{1i} * [\pi_{t-i} - (\pi^T_{t-i} + a)] + \sum_{1}^{n} \beta_{2i} * D_i + v_t,$$

where v_t is a random element, and we will use the grid search method to find that particular triple (p; a; n)* for which the value of AIC$_c$(p; a; n) is minimised.[7]

If we find out that e.g. (p; a; n)* = (1; -0.5 pp; 2), it will mean that the inflation evolution over the entire period under review was defined by two shocks and also by the CNB's bias, i.e. the bias of the forecasting apparatus or of the Bank Board preferences, in the form of the manifested target positioned approximately half of the percentage point below the officially declared target, while the inflation gap persistence corresponded to the AR(1) model.

An advantage of this method of analysis consists in its simplicity, understandability and transparency provided by its exclusively empirical, statistical nature: except for the core assumption of the persistent return of inflation to the (manifested) inflation target, there are neither any theoretical assumptions present in the background of the computations as to the structure or functioning of an economy, nor any quantitative, calibration-type assumptions as to the values of parameters, nor any other expert interventions. A disadvantage consists in the fact that the method may miss the shocks that did not last very long and did not occur recurrently (and therefore are not reflected in the CNB's bias), while they were manifested not through any abrupt and extensive shift in the inflation gap values but through a "creeping" increase of these values over several months (and therefore are not reflected within the shocks).

[6] If, after another explanatory variable (another shock in our case) is entered in to the estimation, the improvement in the quality of the estimates is big enough to compensate for the loss of one degree of freedom as a result of the use of the added variable, then the AIC value decreases; and it increases in the opposite case. Therefore, when deciding whether to enter another explanatory variable into our statistical model we should minimize the AIC values, see e.g. Burnham & Anderson (2004).

[7] It may be expected intuitively that if all shocks were anti-inflationary, then for the given p, an increase in n (an increase in the number of shocks) will result in an increase in a (the estimated degree of anti-inflationary CNB's bias toward zero will move from negative values closer to zero). However, we will see later that the reviewed set of observations contains what seem to be shocks towards higher inflation, too.

The described method per se will demonstrate a combined statistical force of hypotheses 1 and 2 (as compared to the force of hypothesis 3), i.e. the statistical significance of the combined impact of the bias in the forecasting apparatus and the bias in the preferences of the Bank Board. A separated impact of the two factors then may be estimated by adding information on the deviations in the Bank Board decisions from the decisions consistent with the outputs of the forecasting apparatus: for example, if the actual monetary policy decisions were not systematically deviating from the forecasting apparatus outputs, the identified combined force of hypotheses and 2 may be fully attributed to hypothesis 1 (the forecasting apparatus' bias).

Such separation of the impact of the bias in the forecasting apparatus from the bias in the preferences of the Bank Board is, of course, possible only for the periods in which the forecasting apparatus outputs contained recommendations in terms of concrete monetary policy decisions. In the CNB case, this condition is met from the point of migration to the "unconditional" integrated forecast in 2002.

In order to obtain the difference between forecasted and actual setting of the interest rates for each month in the context of quarterly forecasts (which has been the case of the CNB), the setting of interest rates that would be hypothetically forecasted one and two months, respectively, after the actual preparation of the last forecast will be approximated here as a weighted average of the forecast for the complete quarter and of the actual setting in a given month (because such actual setting includes information on implications of the data published after the forecast completion). To derive the hypothetical forecast for the first month after the preparation of the last actual quarterly forecast, we will use the weights 2:1 in favour of the last forecast, while for the second months, the weights will be 1:2 in favour of the actual setting.

5. RESULTS

For the period of 12/1998–12/2007, we have 109 monthly values of the inflation gap.

Minimisation of the *standard* AIC suggests AR(2) as the best suitable model of the inflation gap evolution and identifies a few shocks as statistically significant. Nevertheless, since the AIC_c is more suitable for small samples, while converging to the standard AIC for large samples, it is better to follow the AIC_c values.

Minimisation of the AIC_c leads also to the conclusion that the inflation gap evolution over the period under review may be best explained as a result of the AR(2) process. With AR(2) process, there are 107 observations available. The deviations of the actually observed values of the inflation gap from the model values identify potential shocks. These deviations, in the order of their occurrence over time, are displayed (together with the inflation gap evolution) in Figure 3 and, in the order of their size, in Figure 4.

Figure 3: Inflation gap and residuals of its AR(2) model

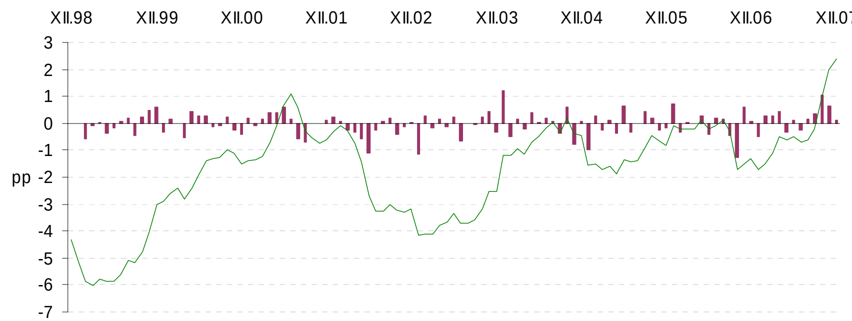
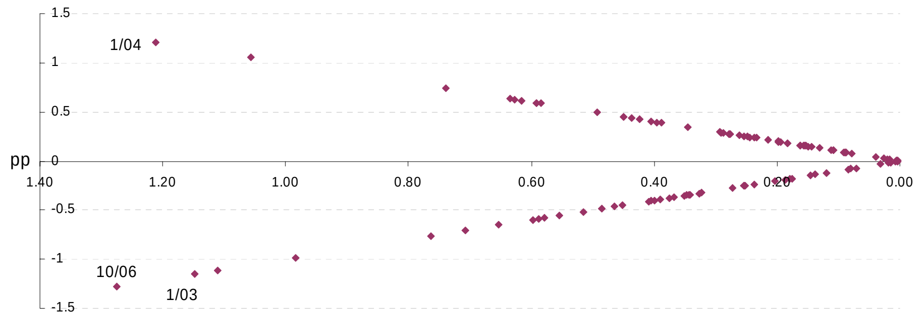


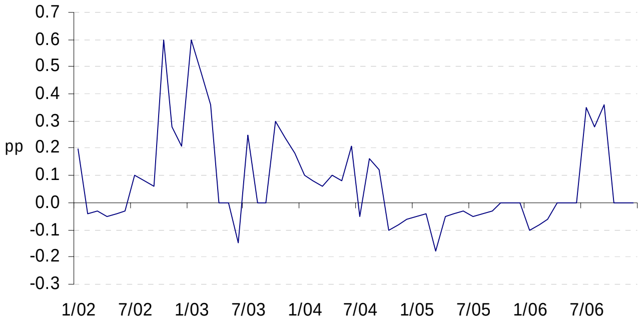
Figure 4: Residuals of the AR(2) model of the inflation gap, ordered by their size



Numerous sizeable differences between the actual inflation gap and the AR(2) model value occurred in the course of the period under review. In spite of this, minimisation of the AICc leads to the conclusion that the AR(2) process without a single distinct shock provides the best description of the reality, in the context of a clear (-0.5 pp) constant bias of the CNB in favour of a lower than officially targeted inflation level.

Thanks to the CNB's migration to "unconditional" integrated forecasting in 2002, we are able to distinguish, within the impact of the CNB's bias, the impact of the forecasting apparatus' bias and the impact of the Bank Board's preferences. A simple computation shows (see Figure 5) that the Bank Board deviated, in its decisions at the corresponding points of time (1/2002–12/2006), by approx. 0.08 pp on average from the decision consistent with the forecasting apparatus output. Taking into account the sensitivity to the interest rates that inflation exhibits within the apparatus, the above deviation corresponds to the average impact on inflation of approximately 0.03 pp. It may be then claimed that the identified bias of the CNB over the period of 1/2003–12/2007 is largely attributable to the biased forecasting apparatus.

Figure 5: Estimated deviations of actual setting of 3M PRIBOR from setting consistent with the forecasting apparatus outputs



It is apparent from Figures 3 and 4 that several unexpected shifts occurred in the inflation gap evolution, raising suspicion that they were manifestations of actual shocks: this involves e.g. periods in mid-2002, in the autumn of 2006 or at the end of 2007. However, as is implied by the results of AICc minimisation, even the largest of the shifts (observed in October 2006) is not dramatic enough to make its explicit classification as shock in a regression worth the loss of one degree of freedom in terms of AICc. As a result, out of the three hypotheses on the causes of undershooting, hypotheses A and B are likely to gain more support at the expense of hypothesis S, i.e. undershooting was due to a bias of the CNB rather than to biased shocks.

As noted above, a disadvantage of the shock identification approach adopted in this paper is that is records as "shocks" only those shocks that manifested themselves through an abrupt change in inflation on a month-to-month basis, rather than through changes in inflation that would take place over the long term or recurrently. Many shocks, however, might manifest themselves in inflation as distributed over time, i.e. rather as a series of inflation shifts in one direction, while none of the individual shifts within such a series need in fact be dramatic in itself. Such potential shocks might be identified in the inflation evolution not as deviations of the respective autoregressive process from reality within a single month, but as a series of deviations over several months.

If we wished to identify shocks into inflation in this more structured form, we would have to define a priori what the shock profile over time should precisely look like: how many months in a row the respective dummy variable would need to have a nonzero value and if it were to have an identical value in all such months or if its values were to decrease from an initial maximum, or if they were to initially increase toward such maximum for a month or two, etc.

By transiting to any such "expert" model of the shock into inflation, we would however depart from the core idea of this paper, which consisted in an effort to gain understanding of the key determinants of undershooting inflation targets over the period under review, with the help of maximally model-independent, purely statistical tools. Therefore, if any shocks occurred that were manifested over multiple months in a row, either their manifestations in each of the month were so mild that they escaped the methodology applied in this paper or (if they were acting over the long term or recurrently) they became part of the estimated CNB's bias.

6. SUMMARY

A purely statistical procedure was used for a simple, model-independent analysis of the reasons of non-fulfillment of inflation targets by the Czech National Bank in 12/1998–12/2007, based on an assumption that the suspicion of a shock occurrence is highest in the periods of the largest deviations of the actual inflation gap from its autoregression model. An advantage of the procedure, as opposed to the currently much more popular model approaches, dwells in its simplicity, transparency and no "contamination" by theoretical or expert assumptions of relationships in the economy and by calibration of values of parameters that are difficult to estimate.

There is of course a price to pay in an empirical paper for abstaining from the use of additional sources of information. The price is our ability to discern only two general types of shocks. First, they are the shocks that were manifested in the long term or recurrently; we understand these shocks as a manifestation of a permanent bias of the central bank, whether or not deliberate, and whether or not such bias was given by an asymmetry of the Bank Board's preferences or asymmetry of the forecasting apparatus (e.g. by constantly underestimating the forecasted appreciation of the nominal exchange rate). Second, they were the shocks that manifested themselves through a one-off, abrupt change of inflation from month to month – only these shocks are considered actual shocks under the procedure adopted in this paper.

The adopted statistical procedure leads to the conclusion that the CNB's bias over the examined period of 12/1998–12/2007 was rather towards lower than officially targeted inflation. The extent of this bias in the anti-inflationary direction was approximately 0.5 percentage points. The best statistical fit among autoregression models of inflation deviations from the target was provided by the AR(2) process around a manifested target, deviating by the above 0.5 pp from the official target in the direction of lower inflation, while this evolution was not affected by any statistically significant one-off shock to inflation.

Furthermore, a comparison of the interest rate forecasts produced by the forecasting apparatus and of actual monetary policy decisions of the CNB Bank Board since 2002 showed that the Bank Board sticked in its decisions rather firmly to the forecasts. Thus, at least over the years 2003–2007, the CNB's bias was due primarily to the forecasting apparatus bias rather than the bias in the preferences of the Bank Board.

This paper, based on the simple, model-independent procedures, certainly brings no detailed and exhaustive analysis of the given issue; instead, it provides just a sketchy and indicative idea of the relative weights of core potential causes of the non-fulfillment of the inflation target in the Czech Republic during the period under review.

We may view the contribution made by this paper on a more general level, specifically in drawing attention to a seemingly marginal fact, no longer perceived by many researchers and policy analysts in the current era of very complex and highly structured models: The price to pay for being free of theoretical, expert, calibration and similar assumptions is the low information content of results; conversely, we pay for rich results by carrying the burden of all the theoretical and empirical assumptions made explicitly or implicitly.

In addition, this paper points indirectly to the following terminological and perhaps somewhat provocative question: for how long or how often must the central bank be surprised from a certain direction (let us say from the direction of the nominal exchange rate appreciation) to make us assess such surprises ex post not as "shocks" but as "the bias of the forecasting apparatus of the central bank"?

REFERENCES

BURNHAM, K. P. AND D.R ANDERSON (2004): "Multimodel inference: Understanding AIC and BIC in model selection," *Sociological Methods in Research*, 33, 261–304.

COATS, W., D. LAXTON, AND D. ROSE (eds.) (2003): *The Czech National Bank's Forecasting and Policy Analysis System,* Prague, CNB.

CUKIERMAN, A. AND A. MUSCATELLI (2008): "Nonlinear Taylor rules and asymmetric preferences in central banking: Evidence from the United Kingdom and the United States," *The B.E. Journal of Macroeconomics*, 8 (1), Article 7, http://www.bepress.com/bejm/vol8/iss1/art7.

CNB (2003): "ČNB pozměňuje typ své prognózy inflace (The CNB changes the type of its inflation forecasting)," In: Inflation report - July 2002. Prague, CNB.

FILÁČEK, J. (2007): "Why and How to Assess Inflation-Target Fulfillment," *Finance a úvěr - Czech Journal of Economics and Finance*, 57, 577–594.

SVENSSON, L.E.O. (1996): "Inflation forecast targeting: Implementing and monitoring inflation targets," NBER WP 5797, http://www.nber.org/papers/5797.